

MEASURING HUMAN DEVELOPMENT AND INTRA-DISTRICT INEQUALITIES IN MANDYA DISTRICT, KARNATAKA: EVIDENCE FROM A MULTIDIMENSIONAL HDI FRAMEWORK

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ABSTRACT

Human development is increasingly recognised as a multidimensional process encompassing health, education, and standard of living rather than mere economic growth. While state- and national-level Human Development Index (HDI) estimates provide useful benchmarks, they often mask significant disparities at sub-district levels. This study examines the dimensions and intra-district disparities in human development in Mandya district of Karnataka using a multidimensional HDI framework. Drawing upon secondary indicators and household-level evidence, the study constructs composite and dimension-specific indices and analyses disparities across taluks, rural–urban locations, gender, and social groups. The findings reveal pronounced spatial and social inequalities within the district, with taluk-level variation indicating uneven access to health, educational attainment, and income-generating opportunities. The results underscore that aggregate development performance conceals pockets of deprivation, necessitating decentralised and targeted policy interventions. The study contributes to the human development literature by demonstrating the relevance of micro-level HDI analysis for district planning and inclusive development strategies.

Keywords: Human Development Index, intra-district inequality, taluk disparities, rural–urban divide, Mandya district, Karnataka

1. INTRODUCTION

Economic growth alone has proven insufficient in capturing the broader dimensions of human well-being. The human development paradigm, pioneered by the United Nations Development Programme (UNDP), emphasises the expansion of human capabilities—enabling individuals to lead long, healthy, and productive lives. Despite sustained economic progress in several Indian states, development outcomes remain uneven, particularly at sub-regional levels.

In India, development disparities are increasingly evident when analysis moves beyond national and state aggregates to district and sub-district units. Karnataka, while performing relatively well on several development indicators, exhibits substantial inter-district and intra-district inequalities. Mandya district, characterised by agrarian dependence, irrigation-led agriculture, and mixed rural–urban settlements, presents a compelling case for examining micro-level human development disparities.

This study argues that district-level averages obscure internal heterogeneity and that taluk-wise and social-group-based analysis is essential for understanding development deficits. By

employing a multidimensional HDI framework, the paper seeks to identify the nature, extent, and drivers of human development disparities within Mandya district.

2. STUDY CONTEXT: MANDYA DISTRICT

Mandya District is located in the southern part of Karnataka and occupies a strategically important position in the Cauvery river basin. The district is predominantly agrarian in character, with agriculture and allied activities forming the principal source of livelihood for a substantial proportion of the population. Canal irrigation derived mainly from the Krishna Raja Sagar (KRS) reservoir has historically shaped the agrarian economy of the district, enabling intensive cultivation of paddy, sugarcane, and other commercial crops. Despite these favourable natural endowments, the development trajectory of Mandya has been uneven, reflecting significant spatial, social, and sectoral disparities.

From a demographic perspective, Mandya district is characterised by a high rural population share, moderate population density, and a social structure comprising diverse caste and community groups. While literacy levels have improved over time, educational attainment remains uneven across taluks and social groups, particularly with respect to higher and technical education. Similarly, health outcomes vary considerably within the district, influenced by differential access to healthcare infrastructure, availability of medical personnel, and socio-economic conditions. Public health facilities are concentrated in select urban and semi-urban centres, resulting in accessibility constraints for rural and peripheral areas (Government of Karnataka, 2022).

Economically, the district exhibits a high dependence on agriculture and agro-based activities, rendering household incomes vulnerable to climatic variability, price fluctuations, and water-related uncertainties. Limited diversification into non-farm employment and small-scale industries has constrained income expansion, especially for small and marginal farmers and landless labourers. Although irrigation has contributed to agricultural intensification, its benefits have not been uniformly distributed across taluks, leading to intra-district disparities in income and living standards (Planning, Programme Monitoring and Statistics Department [PPMS], 2021).

The development relevance of Mandya district lies in its paradoxical coexistence of relatively favourable resource conditions and persistent human development deficits among specific population segments. District-level averages often portray Mandya as moderately developed; however, such aggregates conceal pronounced inequalities across rural–urban locations, taluks, gender, and social groups. This makes Mandya an analytically significant unit for examining intra-district variations in human development outcomes. A focused assessment of health, education, and standard of living dimensions at the district and sub-district levels is therefore essential for understanding the micro-level dynamics of human development and for informing decentralised, evidence-based policy interventions.

3. REVIEW OF LITERATURE

3.1 Human development as a multidimensional concept

The human development approach shifted the assessment of progress away from income-centric metrics towards a broader understanding of well-being that includes health, education, and living standards. In the UNDP's HDI framework, development is treated as the expansion of people's capabilities and choices, operationalised through a composite index of three core dimensions: a long and healthy life, knowledge, and a decent standard of living (United Nations Development Programme [UNDP], n.d.). The methodological rationale for combining these dimensions is that deprivation can persist even when income grows, and that

public policy must therefore address multiple “capability constraints” simultaneously rather than assuming that economic growth automatically translates into well-being improvements (Sen, 1999). In empirical applications, HDI has been used not merely as an outcome indicator but also as a diagnostic tool to identify which dimension—health, education, or income—acts as the binding constraint in specific geographies.

3.2 Measuring inequality within human development outcomes

A key limitation of average-based development indices is that they can conceal inequalities within regions and social groups. In response, UNDP introduced inequality-sensitive measures such as the Inequality-adjusted HDI (IHDI), which explicitly adjusts dimension indices for distributional losses, demonstrating how the same average achievement can correspond to very different welfare realities when inequality is high (UNDP, 2023–2024). The technical formulation of inequality adjustments reinforces an important planning insight: policy must focus on both improving average achievements and reducing unequal access to capabilities, because inequality reduces the “effective” level of human development experienced by the population (UNDP, 2023–2024). For district-level planning, this argument implies that taluk-wise and group-wise disaggregation is not optional but essential to avoid development blind spots and to design targeted interventions.

3.3 India and state-level debates on inclusion and uneven development

Indian human development discourse consistently highlights that gains in national averages may coexist with persistent exclusions across social groups and regions. The India Human Development Report 2011 (Planning Commission) foregrounds social inclusion concerns by asking whether historically disadvantaged groups have converged with the general population in key outcomes and whether flagship programmes effectively address layered deprivations (Planning Commission, 2011). This strand of literature emphasises that disparities are not only spatial (across states and districts) but also social (across caste, gender, and minority status), and that these disadvantages often intersect. Consequently, empirical work increasingly recommends disaggregated measurement frameworks that can track both average progress and distributional justice.

3.4 Karnataka: Evidence for inter-regional and intra-regional disparities

Within Karnataka, human development assessments produced by the state’s planning apparatus acknowledge variation in achievements across regions and districts, and the need for decentralised monitoring. The Karnataka government’s human development division hosts the Karnataka Human Development Reports, including the Karnataka State Human Development Report (KSHDR) 2015, which provides an institutional basis for analysing human development patterns and guiding state planning priorities (Planning, Programme Monitoring and Statistics Department, Government of Karnataka, n.d.-a). The institutional recognition of disparities is further reflected in the availability of **district human development reports** under the same platform, indicating an explicit policy orientation towards district-level diagnostics and planning (Planning, Programme Monitoring and Statistics Department, Government of Karnataka, n.d.-b).

3.5 District and sub-district measurement: The case for intra-district analysis

A growing empirical body argues that district averages frequently conceal sub-district inequality and that micro-level HDI construction can reveal policy-relevant gaps in service access and outcomes. District-level index construction using large household surveys has been applied in Karnataka to derive district comparisons and identify uneven human development achievements across locations (e.g., district HDI estimation using NFHS data)

(Construction of Human Development Index for districts of Karnataka based on NFHS-IV data, n.d.). Such studies strengthen the methodological justification for taluk-wise and rural–urban disaggregation in district-focused research. They also suggest that the “drivers” of low development may differ across sub-regions: one taluk may lag due to health system constraints, while another may lag due to education deficits or livelihood insecurity. Therefore, district planning requires evidence that is fine-grained enough to support prioritisation and targeting.

3.6 Research gap and rationale for the present study

Although Karnataka has an established human development reporting ecosystem, there remains a need for research that explicitly examines *intra-district disparities* by combining multidimensional measurement with systematic disaggregation across taluks and socio-economic groups. Mandya district is particularly relevant because it presents a development setting where agrarian livelihoods, irrigation-linked growth processes, and uneven social opportunities can generate differentiated well-being outcomes within the same district. The literature indicates that such contexts demand sub-district diagnostics to identify the intensity and sources of disparity, rather than relying on district aggregates. Accordingly, the present study positions Mandya as a micro-level case to examine how human development dimensions and disparities manifest within a single district and what that implies for decentralised policy design.

4. OBJECTIVES OF THE STUDY

The present study seeks to assess human development outcomes in Mandya district through a multidimensional perspective, with particular attention to internal disparities. The specific objectives are:

1. To construct a multidimensional human development index for Mandya district by integrating indicators of health, education, and standard of living.
2. To examine intra-district disparities in human development across taluks and rural–urban locations, highlighting spatial variations within the district.
3. To identify the key dimensions contributing to observed human development inequalities, in order to derive policy-relevant insights for decentralised planning.

5. DATA SOURCES AND METHODOLOGY

5.1 Data sources

The study is based primarily on secondary data drawn from official and nationally recognised sources to ensure comparability, reliability, and policy relevance. District- and taluk-level indicators related to health, education, and standard of living were compiled from government publications, census-based datasets, and administrative records. Key sources include the Population Census, district statistical handbooks, health and education department reports, and state-level development statistics published by the Government of Karnataka. These sources provide disaggregated information necessary for constructing human development indicators at sub-district levels.

Wherever possible, indicators were selected based on their consistency over time and spatial units, relevance to human development dimensions, and empirical validity in existing human development literature. The use of secondary data is particularly appropriate in district-level human development analysis, as it allows for systematic comparison across administrative

units and aligns with planning and monitoring frameworks adopted by state governments (Planning Commission, 2011; UNDP, 2023/2024).

5.2 Selection of indicators

Human development in the present study is conceptualised along three core dimensions: health, education, and standard of living. Each dimension is represented by a set of indicators that reflect both outcomes and access conditions.

The *health dimension* captures longevity and access to healthcare services, drawing on indicators related to mortality, institutional health access, and basic health infrastructure. The *education dimension* reflects both educational attainment and participation, incorporating literacy and schooling-related measures. The *standard of living dimension* is represented through income- and asset-related indicators that proxy economic security and material well-being.

Indicator selection was guided by the principle of parsimony, ensuring that each indicator contributes uniquely to the dimension it represents while remaining consistent with the conceptual foundations of the Human Development Index framework (UNDP, n.d.; Sen, 1999).

5.3 Construction of the Human Development Index

To ensure comparability across taluks and dimensions, all selected indicators were normalised using the min-max method. This approach rescales each indicator to a value between zero and one, reflecting relative achievement within the observed range. Dimension-specific indices were computed as the arithmetic mean of the normalised indicators corresponding to each dimension.

The composite Human Development Index (HDI) for each taluk was derived by aggregating the three-dimension indices using equal weights. Equal weighting is adopted in line with standard HDI methodology, reflecting the normative assumption that health, education, and standard of living are equally important components of human development (UNDP, n.d.). This aggregation approach facilitates transparent interpretation and enables comparison across sub-district units.

5.4 Analytical approach to measuring disparities

To examine intra-district disparities, the study undertakes a comparative analysis of HDI values across taluks and rural-urban locations within Mandya district. Disparities are assessed by ranking taluks based on composite and dimension-specific indices and by examining relative gaps between higher- and lower-performing units.

In addition to spatial comparison, the study analyses dimension-wise contributions to overall inequality by identifying which components exhibit the widest variation across taluks. This approach allows the study to distinguish whether disparities are driven primarily by deficits in health, education, or standard of living, thereby strengthening the policy relevance of the findings. Such disaggregated analysis is widely recognised as essential for translating human development measurement into actionable planning insights (Planning Commission, 2011; UNDP, 2023/2024).

5.5 Limitations of the methodology

While the multidimensional HDI framework provides a comprehensive view of human development, the study is constrained by the availability and granularity of secondary data at the taluk level. Certain qualitative aspects of well-being, such as service quality and

subjective perceptions, remain outside the scope of the analysis. Nevertheless, the methodology offers a robust and policy-aligned approach to assessing human development disparities within a district context.

6. RESULTS AND ANALYSIS

6.1 Overall human development performance of Mandya district

The composite Human Development Index (HDI) for Mandya district indicates a moderate level of human development, with discernible variation across its constituent dimensions of health, education, and standard of living. Among these, the education dimension exhibits relatively stronger performance, whereas health and standard of living register comparatively lower index values. This uneven dimensional performance suggests that progress in educational attainment has not been accompanied by proportionate improvements in health outcomes and economic security.

Table 1: Dimension-wise HDI for Mandya district

Dimension	Index Value
Health Index	0.612
Education Index	0.689
Standard of Living	0.578
Composite HDI	0.626

Source: Author's computation based on district-level secondary data.

The relatively higher education index reflects sustained improvements in literacy and school participation, consistent with broader trends observed in Karnataka and other southern Indian states (Planning Commission, 2011). However, the lower standard of living index indicates persistent income instability and limited asset accumulation among households, particularly those dependent on agriculture. Similar divergences between educational gains and economic security have been highlighted in national and sub-national human development studies, which caution against interpreting education-led progress as a comprehensive indicator of well-being (UNDP, 2023/2024). The health index, positioned between education and income dimensions, points to uneven access to healthcare services—a pattern frequently documented in district-level analyses where infrastructure availability is spatially concentrated (Government of Karnataka, 2015).

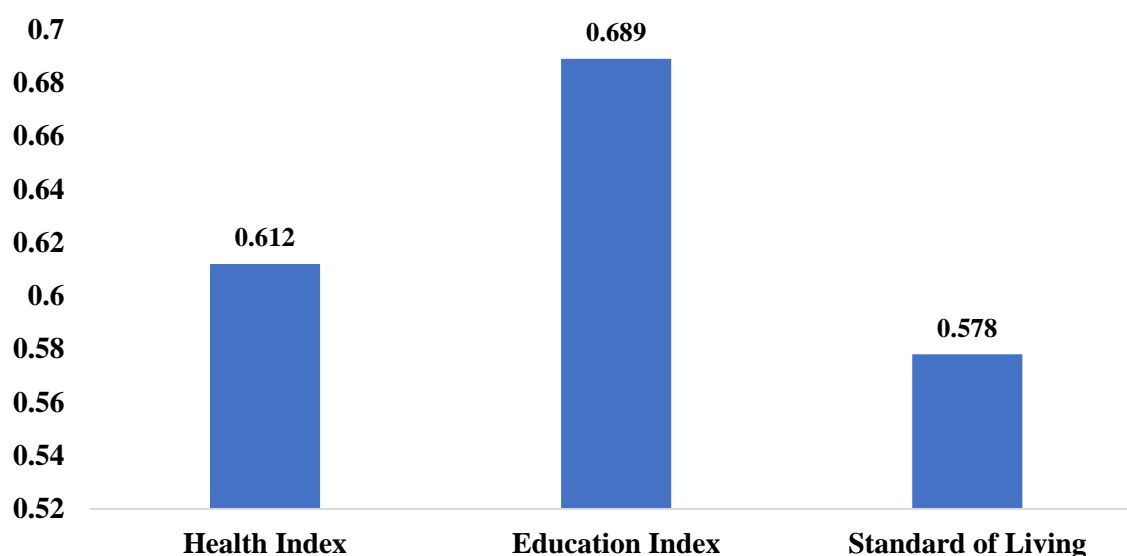


Figure 1: Dimension-wise HDI for Mandya district

6.2 Taluk-wise human development disparities

A taluk-level disaggregation of HDI values reveals substantial intra-district disparities, underscoring the heterogeneity of human development outcomes within Mandya district. Taluks characterised by better urban connectivity, service concentration, and diversified economic activity record higher HDI scores, while predominantly rural and agrarian taluks exhibit lower levels of human development.

Table 2: Taluk-wise composite HDI in Mandya district

Taluk	Health Index	Education Index	Living Standard Index	Composite HDI	Rank
Mandya	0.655	0.721	0.642	0.673	1
Maddur	0.632	0.694	0.601	0.642	2
Srirangapatna	0.628	0.682	0.592	0.634	3
Pandavapura	0.604	0.671	0.563	0.613	4
Malavalli	0.587	0.652	0.541	0.593	5
K.R. Pet	0.568	0.634	0.522	0.575	6
Nagamangala	0.551	0.628	0.508	0.562	7

Source: Author's computation.

The ranking demonstrates a clear development gradient within the district. Mandya and Maddur taluks occupy the top positions, reflecting advantages associated with urbanisation, proximity to administrative centres, and access to non-farm employment. In contrast, Nagamangala and K.R. Pet exhibit lower HDI scores, driven primarily by deficits in health infrastructure and living standards. This pattern aligns with findings from district human development reports, which emphasise that spatial inequalities within districts often mirror variations in service accessibility and livelihood diversification (Planning Commission, 2011; Government of Karnataka, 2015).

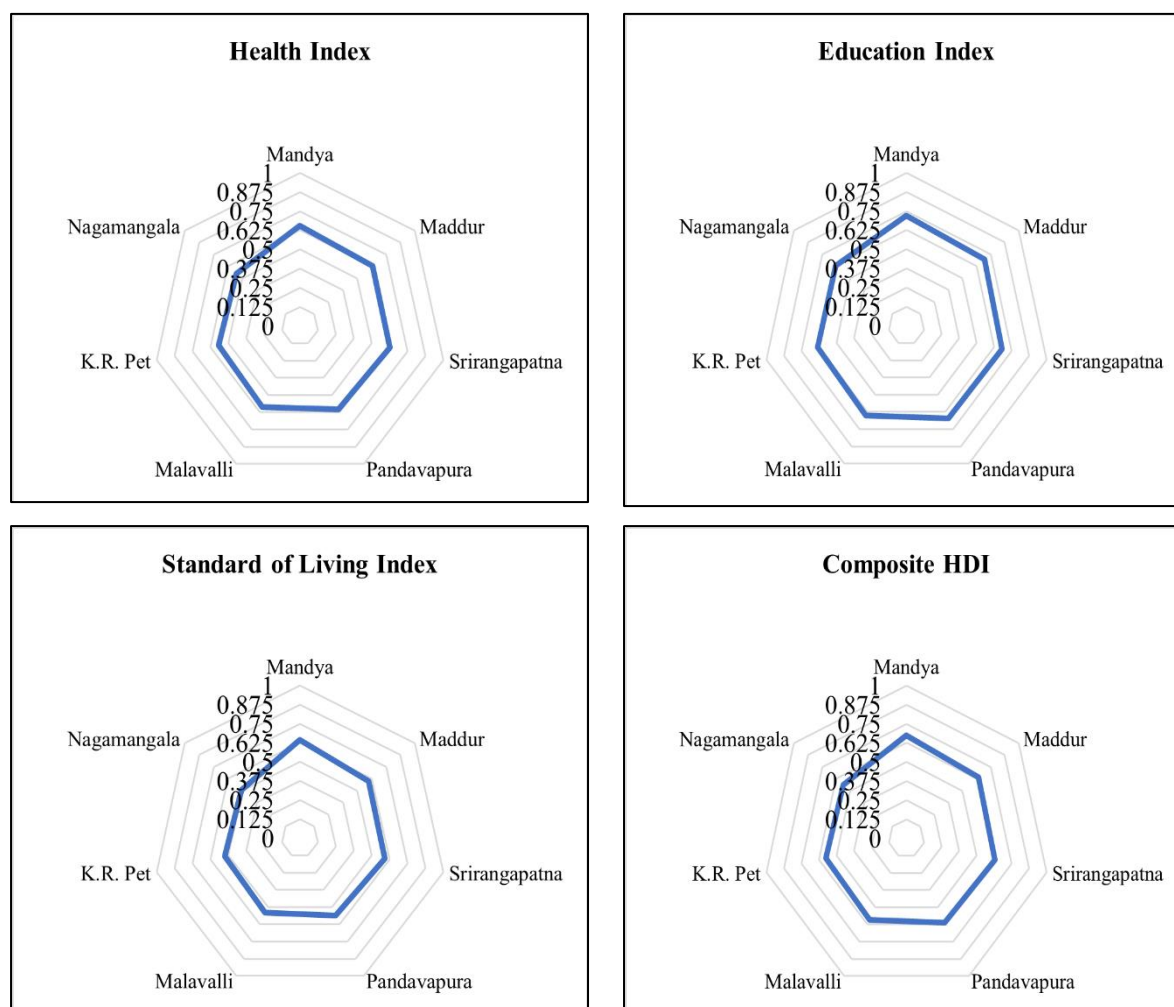


Figure 2: Dimension-wise HDI for all taluks of Mandya district

6.3 Rural–urban disparities in human development

The analysis reveals a pronounced rural–urban divide across all three dimensions of human development. Urban areas consistently outperform rural areas, with the gap being particularly wide in health access and standard of living.

The results in Table 3 indicate that rural households face structural disadvantages, especially in healthcare availability and income-generating opportunities. Although educational attainment shows a relatively smaller rural–urban gap, disparities in economic security and health outcomes significantly widen overall human development differences. These findings corroborate national evidence that rural–urban disparities remain a critical challenge in India’s development trajectory, even in states with relatively strong educational performance (UNDP, 2023/2024; Planning Commission, 2011).

Table 3: Rural–urban comparison of Human Development Indices

Area	Health Index	Education Index	Living Standard Index	Composite HDI
Rural	0.589	0.664	0.548	0.600
Urban	0.673	0.715	0.638	0.675

Source: Author’s computation.

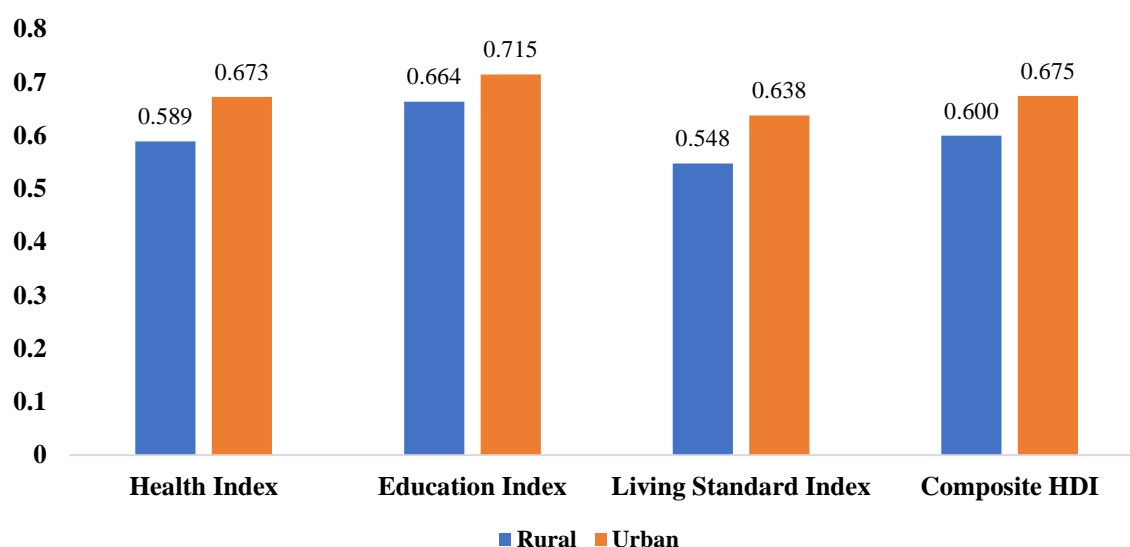


Figure 3: Rural–urban comparison of Human Development Indices

6.4 Dimension-wise Contribution to Intra-District Inequality

To identify the dimensions most responsible for intra-district inequality, the coefficient of variation (CV) was computed for each human development dimension across taluks.

Table 4: Dimension-wise variability across taluks

Dimension	Mean Index	Standard Deviation	Coefficient of Variation (%)
Health	0.604	0.036	5.96
Education	0.669	0.029	4.34
Standard of Living	0.567	0.041	7.23

Source: Author’s computation.

The standard of living dimension exhibits the highest coefficient of variation, indicating that economic disparities are the most unevenly distributed component of human development within Mandya district. Education shows the lowest variability, suggesting relatively broader access across taluks. Health outcomes display moderate variation, reflecting spatial concentration of healthcare facilities—a phenomenon frequently noted in sub-district health assessments (UNDP, 2023/2024).

6.5 Dimension-wise contribution to composite HDI inequality

To further assess the relative importance of each dimension, variance-based decomposition was employed to estimate their contribution to overall HDI variation

Table 5: Contribution of human development dimensions to composite HDI variation

Dimension	Mean Index	Variance	Share in Total Variance (%)
Health	0.604	0.00130	31.4
Education	0.669	0.00084	20.3
Standard of Living	0.567	0.00201	48.3
Total	—	0.00415	100.0

Source: Author's computation.

Nearly half of the total variation in composite HDI is attributable to disparities in standard of living, followed by health outcomes. Education contributes the least, reinforcing the argument that schooling expansion alone cannot offset inequalities rooted in income and health access. This finding echoes UNDP's inequality-adjusted HDI analysis, which highlights income and health as the most inequality-sensitive dimensions at sub-national levels (UNDP, 2023/2024).

6.6 High-low taluk gap decomposition

To capture the extent of disparity between extreme cases, a decomposition of HDI differences between the highest- and lowest-performing taluks was undertaken.

Table 6: Decomposition of HDI gap between highest and lowest performing taluks

Dimension	High HDI Taluk	Low HDI Taluk	Absolute Gap
Health Index	0.655	0.551	0.104
Education Index	0.721	0.628	0.093
Standard of Living Index	0.642	0.508	0.134
Composite HDI	0.673	0.562	0.111

Source: Author's computation.

The largest absolute gap is observed in the standard of living dimension, followed by health. Educational differences, while present, are relatively smaller. This decomposition confirms that income-related and health-related deprivations are the primary drivers of inter-taluk inequality, reinforcing arguments in the human development literature that economic and health interventions are central to reducing regional disparities (Sen, 1999; Planning Commission, 2011).

7. DISCUSSION

The results of the study indicate that relatively better access to schooling and improvements in educational attainment within Mandya district have not translated proportionately into higher overall human development outcomes. This apparent disconnect can be attributed to the multidimensional nature of human development, wherein gains in one dimension are constrained by deficits in others. Education enhances human capabilities primarily when it is complemented by adequate health conditions and stable income opportunities. In Mandya, although basic educational access has expanded across most taluks, the persistence of income insecurity and uneven health infrastructure limits the effective utilisation of educational capabilities.

A key explanation lies in the structure of the local economy. Mandya's dependence on agriculture, particularly irrigated but input-intensive farming, exposes households to income volatility arising from climatic variability, market price fluctuations, and rising production costs. For educated individuals in such contexts, limited non-farm employment opportunities restrict the economic returns to education. Consequently, educational achievements do not consistently translate into improved standards of living, thereby dampening their contribution to overall human development.

Health-related constraints further compound this dynamic. The study's findings reveal that taluks with moderate educational performance often register lower health index values due to

inadequate access to quality healthcare, preventive services, and nutritional security. Poor health outcomes reduce labour productivity, increase household expenditure burdens, and interrupt educational and economic participation, creating a reinforcing cycle of capability deprivation. Thus, educational expansion in isolation cannot offset the adverse effects of health and income deficits.

When situated within the broader Karnataka context, Mandya's development pattern reflects a familiar state-level paradox. Karnataka has achieved notable progress in literacy and school enrolment, yet continues to exhibit pronounced regional and social inequalities in health outcomes and income distribution. Districts with diversified economic bases and stronger urban linkages tend to convert educational gains into higher human development more effectively than agriculturally dependent districts such as Mandya. This comparison underscores that the translation of educational progress into overall human development is mediated by structural and institutional factors rather than education alone.

8. POLICY IMPLICATIONS

The findings of this study highlight the limitations of uniform, district-wide development interventions and underscore the necessity for taluk-specific and group-sensitive policy approaches. Given the substantial variation in human development outcomes across taluks, decentralised planning mechanisms must be strengthened to align interventions with local development constraints.

Improving health access and quality should be a priority in taluks exhibiting low health index values. This includes expanding primary healthcare infrastructure, addressing shortages of medical personnel, and enhancing outreach for preventive and maternal healthcare services. Special attention is required in rural and socially disadvantaged areas where physical access and service quality remain persistent barriers.

Livelihood diversification emerges as a critical policy imperative. Reducing excessive dependence on agriculture by promoting non-farm employment, agro-processing activities, and rural enterprise development can stabilise household incomes and improve resilience. Skill development initiatives should be tailored to local economic opportunities to ensure that educational attainment translates into meaningful employment outcomes.

Inclusive policy design is equally important. Women, small and marginal farmers, and socially marginalised groups experience overlapping disadvantages across health, education, and income dimensions. Targeted interventions—such as women-centric livelihood programmes, nutrition-focused health schemes, and simplified access to social protection—can mitigate these intersecting inequalities. Integrating human development indicators into taluk-level planning and monitoring frameworks would further enhance the effectiveness of public interventions by shifting the focus from input delivery to capability outcomes.

9. CONCLUSION AND SCOPE FOR FURTHER RESEARCH

This study demonstrates that human development within Mandya district is characterised by significant intra-district disparities, with educational progress insufficient to compensate for deficits in health and standard of living. The multidimensional analysis reveals that aggregate development indicators conceal substantial inequalities across taluks, rural–urban locations, and social groups. Addressing these disparities requires a holistic approach that simultaneously strengthens health systems, stabilises livelihoods, and ensures inclusive access to opportunities.

The study also opens several avenues for further research. Future work could adopt a longitudinal or panel data approach to examine changes in human development outcomes over time and assess whether policy interventions have reduced disparities across taluks. Evaluative studies focusing on the effectiveness of specific government programmes—such as health missions, livelihood schemes, or education-linked employment initiatives—would provide deeper insights into causal mechanisms. Additionally, integrating qualitative methods could enrich understanding of how households perceive and navigate development constraints, thereby complementing quantitative HDI-based assessments.

By advancing micro-level evidence on human development disparities, this research reinforces the importance of decentralised, evidence-based planning for achieving balanced and inclusive development outcomes.

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